

## A Planning and Control Toolkit for Dual Arm Manipulation, Phase II

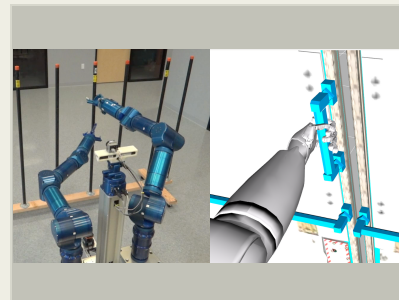
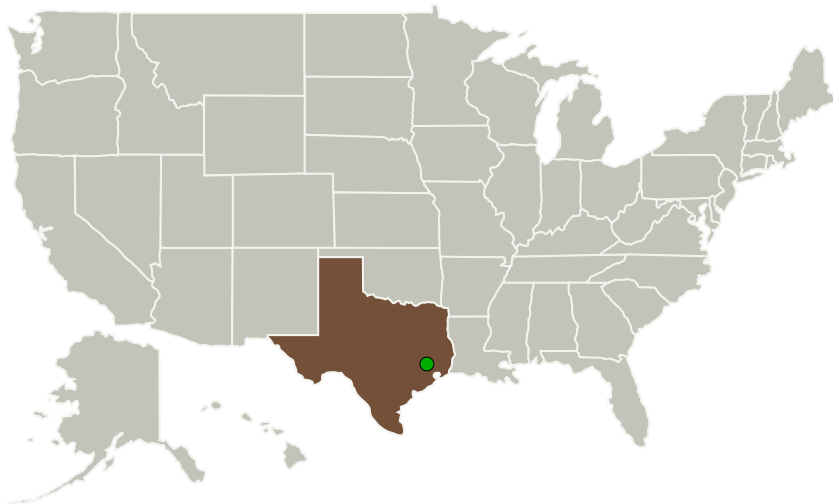
Completed Technology Project (2013 - 2015)



## Project Introduction

It is often difficult to create autonomous robotic capabilities that match what can be achieved via teleoperation. Even though it is mechanically possible for a humanoid robot such as Robonaut 2 to perform complex coordinated tasks such as tying a knot, exchanging objects between end effectors, plugging in connectors, unscrewing a cap, opening a door, or grasping large objects with two hands, our lack of planning algorithms makes it difficult to control these behaviors autonomously. The lack of planning and control algorithms also impedes human-robot interaction as it is difficult for manipulation robots to plan arm trajectories in real-time using active sensing to avoid collisions with humans. This proposal is to develop a suite of planning and control algorithms that will enable NASA robots to perform complex manipulation behaviors in a coordinated way. This work would benefit NASA by making NASA robots more capable and useful during autonomous tasks, by enabling remote supervisors to command more complex tasks, and by enabling NASA robots to operate safely alongside humans during shared tasks.

## Primary U.S. Work Locations and Key Partners



A Planning and Control Toolkit  
for Dual Arm Manipulation

## Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Images	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	3
Technology Areas	3
Target Destinations	3

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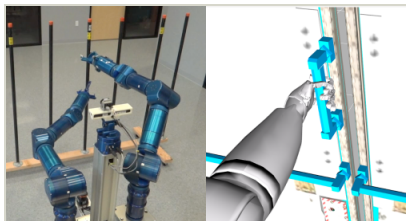
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Organizations Performing Work	Role	Type	Location
TRAC Labs, Inc.	Lead Organization	Industry	Webster, Texas
● Johnson Space Center (JSC)	Supporting Organization	NASA Center	Houston, Texas

## Primary U.S. Work Locations

Texas

## Images



## Project Image

A Planning and Control Toolkit for Dual Arm Manipulation  
 (<https://techport.nasa.gov/image/134115>)

## Organizational Responsibility

## Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

## Lead Organization:

TRAC Labs, Inc.

## Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

## Program Director:

Jason L Kessler

## Program Manager:

Carlos Torrez

## Principal Investigator:

Robert Burridge

## Co-Investigator:

Robert R Burridge



## Technology Maturity (TRL)

Start: **3**  
Current: **5**  
Estimated End: **5**



## Technology Areas

### Primary:

- TX04 Robotic Systems
  - └ TX04.3 Manipulation
    - └ TX04.3.4 Sample Acquisition and Handling

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System